May 1974
No. 5

FISHING INFORMATION

Southwest Fisheries Center-La Jolla, California

noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / NATIONAL MARINE FISHERIES SERVICE

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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FISHING INFORMATION

MAY 1974, No. 5

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R. Shomura, Director, Honolulu Laboratory

PREFACE

This publication, Fishing Information, appears monthly and contains 1) fishery advisory information, 2) a narrative description of pertinent surface temperature conditions, 3) a narrative description of subsurface temperature structure for parts of the North Pacific, 4) charts of winds and pressures for the eastern North Pacific, 5) charts of sea surface temperature for the North Pacific and eastern tropical Pacific, and 6) charts of subsurface temperature structure in the eastern North Pacific.

A supplement to Fishing Information appears at 15-day intervals throughout the year. This is a chart of sea surface temperature (contoured at 2°F (1°C) intervals) from Baja California to Vancouver Island out to about 135°W. Special bulletins are published in conjunction with the 15-day sea surface temperature charts which include short-term projections of albacore distribution and locations of productive fishing areas, information on oceanographic and atmospheric conditions, and other information as is appropriate during the albacore fishing season.

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Scripps Institution of Oceanography, La Jolla, California
Fishing vessels, Anne M., Antonina C., Apollo, Aquarius, Balboa, Bettie M., Bold Contender, Carol S., Carol Virginia, City of San Diego, Eileen M., Elizabeth C.J., Elsinore, Francis Ann, Gina Karen, King Oscar, Larry Roe, Lois Seaver, Marco Polo, Maria Elena, Marietta, Margaret L., Mary Barbara, Mary S., Mermaid, Neptune, Pacific Queen, Patricia Lee, Polaris, Proud Heritage, Queen Mary, Raefello, San Juan, Saratoga, Sea Quest, Theresa Ann, Trinidad, Venturous, Voyager, Westport, Willa G.

Expendable bathythermograph observations are made by the mates of the S.S. Hawaiian Enterprise of Matson Navigation Company. The data are processed under supervision of Dr. D.R. McLain at the NMFS Pacific Environmental Group, Monterey, using computer facilities of the Fleet Numerical Weather Center. The project is partially supported by the National Science Foundation and the Office of Naval Research under Government Order NA onr-9-74.

Albacore Tuna Forecast for 1974

R. Michael Laurs and Staff
Albacore Fishery Investigations

This is the 14th annual advisory to be issued by the National Marine Fisheries Service for the albacore fishery off the North American Pacific Coast.

It appears that during the 1974 Pacific West Coast albacore tuna fishery that approximately 60% of the catch will be taken in waters north of San Francisco and 40% in waters to the south. Catches off California are expected to improve this year over 1973 when the catch was divided about 80% north of San Francisco and 20% south with most of the catch coming from waters off the Pacific Northwest. If 1974 is like an "average" year, a total of 20,050-30,350 tons of fish could be expected to be landed. This estimate of landings is based on the mean and standard deviation 25,200 and 5,150 tons, respectively, of West Coast albacore catches for the period 1964-1973. The increase in fleet capacity that has occurred in recent years and the possibility of an early start of the fishery this year could boost the 1974 catch above the "average." Also, poor weather conditions and low availability of fish could reduce the 1974 catch below "average." An accurate pre-season prediction of how much fish will be caught during the 1974 season is difficult to make because of insufficient knowledge concerning the population dynamics of the North Pacific albacore and fish-ocean relationships.

The forecast of the general distribution of the albacore fishery is based on predictive indices developed at the National Marine Fisheries Service, La Jolla Laboratory, which relate north-south geographic variations in the fishery with oceanographic and meteorological conditions during spring months in certain offshore waters through which albacore migrate in their travel to waters off North America.

The outlook for albacore sportsfishing off southern California is good, based on offshore scouting reports.

RECENT TRENDS IN OCEANIC AND ATMOSPHERIC CONDITIONS

Prevailing weather conditions during the first 2 weeks of June allowed seasonal warming to occur in most areas offshore western North America, except for one region southwest of Vancouver Island and another between Cape Blanco and Point Arena where temperatures cooled by as much as 2° F (1.1° C) from those during the last half of May. The most pronounced warming occurred in an offshore area between 35°-45° N and 128°-136° W where sea surface temperatures rose 2°-4° F (1.1°-2.2° C) from values during the previous 2-week period. Above-normal warming also occurred offshore southern California and northern Baja California out to about 300 miles where temperatures also increased by 2°-4° F (1.1°-2.2° C).

As a result of these changes, sea surface temperatures are 1°-2° F (0.6°-1.1° C) below normal along most of the North American coast, except for a 60-100 mile band of slightly above-normal temperatures that extends from Point Sur southward along southern and Baja California. Above-normal temperatures of 1°-2° F (0.6°-1.1° C) exist in an offshore area between 32°-43° N and west of 130° W longitude.

During the winter of 1973-1974, thermal conditions in the eastern North Pacific were characterized by above-normal temperatures between latitudes 20°-30° N and longitudes 120°-155° W and betwee latitudes 20°-43° N and longitudes 155°-180° W, while below-normal temperatures prevailed over a lar area extending southwestward from the Gulf of Alaska along the entire North American West Coast. Th pattern began to change in March when sea surface temperatures in the central region of the eastern North Pacific decreased by more than 2° F (1.1° C), and waters out to about 300 miles off the coasts of

southern California and northern Baja California warmed by 1°-2° F (0.6°-1.1° C). These changes continued throughout April and resulted in a spreading of below-normal temperatures into central regions, while cool temperatures along the coast south of 35° N edged closer to normal values. However, by the end of May these changes had reversed, and the sea surface temperature pattern over the eastern North Pacific resembled that at the end of February.

Atmospheric circulation patterns over the eastern North Pacific were remarkably similar during the winter of 1973-1974 and spring of 1974, with persistent below-normal pressures over the Gulf of Alaska and above-normal pressures offshore the U.S. West Coast south of 40° N latitude. Below-normal pressures in the Gulf of Alaska indicate an increased frequency of storms passing over this area, and this would tend to keep sea surface temperatures below-normal due to high heat loss through evaporative cooling.

These circulation patterns would also result in an increased frequency of south to southwesterly winds over central regions of the eastern North Pacific, which, in turn, would create conditions favorable for above-normal sea surface temperatures because of less evaporative cooling and a transport of warm water into the area from more southerly latitudes.

According to information supplied by the Long Range Prediction Group of the National Weather Service, air temperatures over interior regions of the western U.S. are expected to be above-normal from mid-June through mid-July, and also to some degree over the entire summer season. These conditions, coupled with the normal development of high pressures offshore, should cause frequent periods of strong north-northwesterly winds off the U.S. West Coast. Although these conditions are favorable for creating thermal fronts along the coast, fishing efforts may be hampered by frequent periods of strong winds and rough seas.

HISTORICAL TRENDS IN CATCHES

Seasonal landings of albacore tuna for the Pacific West Coast (U.S. and Canada) for the period 1938-1973 are shown in Plate 1. This chart does not take into account changes in fishing effort or efficiency. West coast landings for the 1973 season, based on preliminary information were approximately 41 million pounds. This is markedly lower than the 1972 total catch of 68.4 million pounds and below the 1963-1972 average of 51.6 million pounds. The lower catch in 1973 was in part due to 1) a late arrival of the fish and start of the season, 2) fishermen being unable to "stay on fish" at times during the season, and 3) poor weather conditions off California which hampered fishing operations during much of the season.

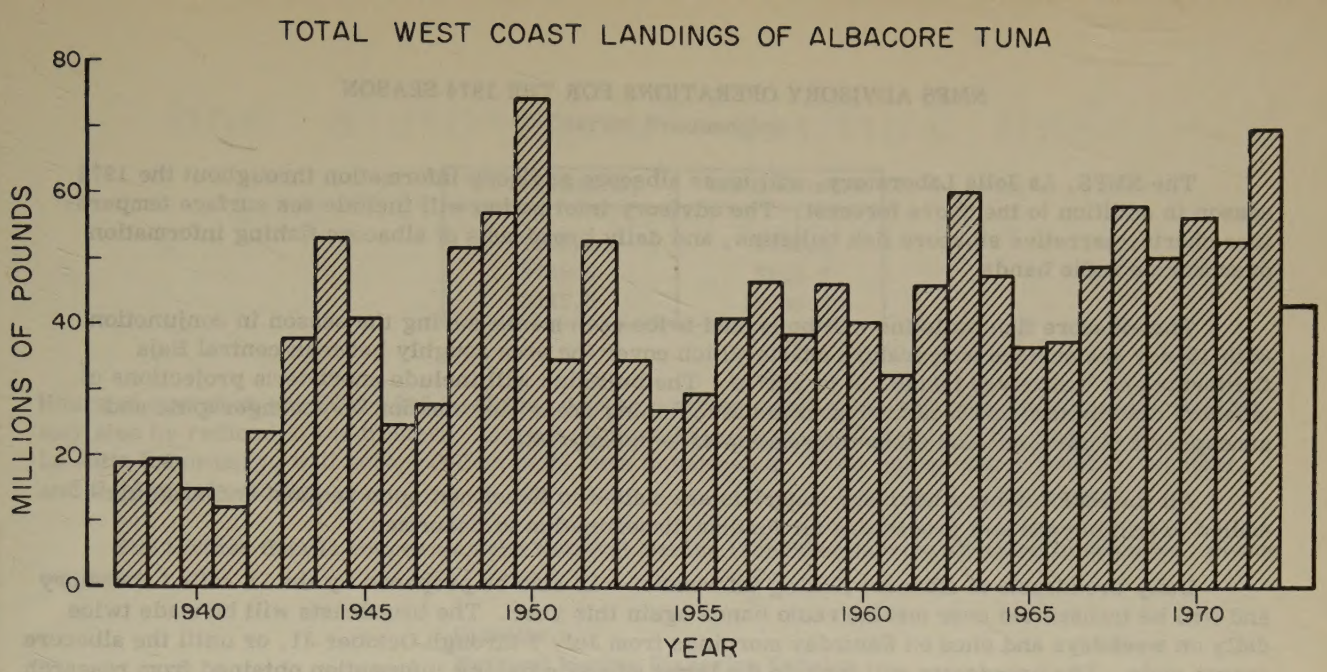
The percentage of the total West Coast catch taken north of San Francisco for the period 1938-1973 is shown in Plate 2. The percentage north-south distribution of catch reflects the large shifts in the location of the centers of the albacore fishery which have taken place over the 35 years. During 1973, about 80% of the catch was taken north of San Francisco and 20% south.

Albacore landings by states for recent years are as follows:

Albacore landings by state for 1969-1973
(in millions of pounds)

	1973*	1972*	1971*	1970	1969
California	8.6	21.0	36.1	29.9	14.7
Oregon	16.3	23.6	8.4	21.8	29.8
Washington	13.1	16.2	5.3	4.3	3.5
British Columbia	2.8	7.6	3.7	1.6	2.5

*Preliminary



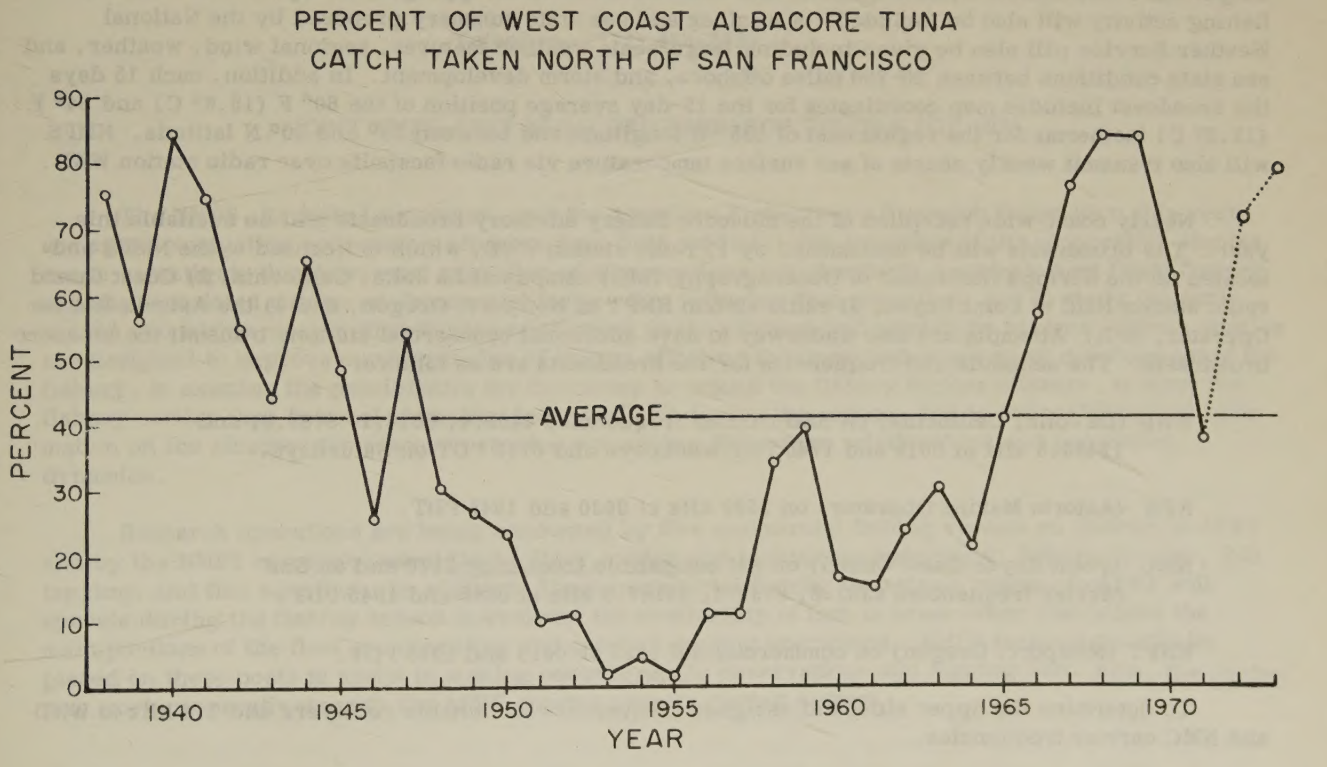


PLATE 1.— Top graph: Total west coast landings of albacore tuna in millions of pounds, 1938–1973.

PLATE 2.— Bottom graph: Percent of west coast albacore tuna catch taken north of San Francisco, 1938–1973.

NMFS ADVISORY OPERATIONS FOR THE 1974 SEASON

The NMFS, La Jolla Laboratory, will issue albacore advisory information throughout the 1974 season in addition to the above forecast. The advisory information will include sea surface temperature charts, narrative albacore fish bulletins, and daily broadcasts of albacore fishing information over marine radio bands.

The albacore fish bulletins will be issued twice each month during the season in conjunction with 15-day sea surface temperature charts which cover the area roughly between central Baja California and Vancouver Island out to 135° W. The bulletins will include short-term projections of albacore distribution and locations of productive fishing areas, information on oceangoraphic and atmospheric conditions, and other information as is appropriate.

All the NMFS fishery advisory materials are mailed to fishermen upon request and are bulk-mailed to fish buyers and processors for further dissemination to fishermen.

Daily broadcasts of albacore fishing information will also be prepared by the La Jolla Laboratory and will be transmitted over marine radio bands again this year. The broadcasts will be made twice daily on weekdays and once on Saturday mornings from July 9 through October 31, or until the albacore season ends. The broadcasts will include the latest albacore fishing information obtained from research vessels, cooperating fishing vessels, and unloading station operators. Highlights will include location of active centers of fishing, typical fishing scores, size of fish, sea surface temperature and subsurface temperature information when available, and other information as appropriate. Sport boat albacore fishing activity will also be included. A weather and sea state summary prepared by the National Weather Service will also be given including large-scale weather features, regional wind, weather, and sea state conditions between 20-250 miles offshore, and storm development. In addition, each 15 days the broadcast includes map coordinates for the 15-day average position of the 60° F (15.6° C) and 64° F (17.8° C) isotherms for the region east of 135° W longitude and between 15° and 50° N latitude. NMFS will also transmit weekly charts of sea surface temperature via radio facsimile over radio station WWD.

Nearly coast-wide reception of the albacore fishery advisory broadcasts will be available this year. The broadcasts will be transmitted by 1) radio station WWD, which is licensed to the NMFS and located on the Scripps Institution of Oceanography (SIO) campus at La Jolla, California, 2) Coast Guard radio station NMC at Point Reyes, 3) radio station KNPT in Newport, Oregon, and 4) the Astoria Marine Operator, KFX. Attempts are also underway to have additional commercial stations transmit the albacore broadcasts. The schedule and frequencies for the broadcasts are as follows:

WWD (La Jolla, California) on SSB carrier frequencies 4409.4, 8644.1, 8789.6, and 12424.5 kHz at 0615 and 1745 PDT weekdays and 0715 PDT on Saturdays.

KFX (Astoria Marine Operator) on 2598 kHz at 0630 and 1945 PDT.

NMC (Point Reyes Coast Guard) on AM compatible frequency 2670 and on SSB carrier frequencies 4383.8, 8732.1, 13147.5 kHz at 0645 and 1945 PDT.

KNPT (Newport, Oregon) on commercial AM 1310 at 0615 and 1915 PDT.

To determine the upper sideband assigned frequencies for tunable receivers add 1.4 kHz to WWD and NMC carrier frequencies.

WWD will transmit charts of sea surface temperature via radiofacsimile during the fishing season for the area of the albacore fishery on upper SSB carrier frequency 8644.1 kHz. Broadcasts are being made at 1000 PDT on Fridays.

The success of the albacore advisory program depends on the input of timely, first-hand information from fishermen at sea, as well as from dock operators and processors. Fishermen are encouraged to report oceanographic, weather, and fishing information. As a channel of communication for such information radio station WWD will operate the following voice single sideband frequencies and schedules.

Carrier Frequencies

WWD Transmit	WWD Receive
4409.4	4410.8
8789.6	8255.6
13147.5	12368.5

Hours of operation are 0600-1800 local time during weekdays and 0800-1700 on weekends. Information may also be radioed to the Western Fishboat Owners Association, call letters WHG, and the NMFS, La Jolla Laboratory, will accept collect calls from fishermen at sea to report oceanographic, weather, and fishing information.

For further details concerning the National Marine Fisheries Service albacore information, please contact:

Director
National Marine Fisheries Service
Southwest Fisheries Center
P. O. Box 271
La Jolla, California 92037

Telephone (714) 453-2820

JOINT NMFS-AFRF ALBACORE RESEARCH STUDIES FOR 1974

The NMFS, La Jolla Laboratory, and the American Fishermen's Research Foundation this year are again conducting cooperative albacore tuna field studies. The purposes of the cooperative studies are to investigate the shoreward migration of albacore tuna into the North American West Coast fishery and the associated marine environmental factors that influence this migration, and to study the early-season and within-season distribution of albacore in the offshore and nearshore regions. These studies are designed to improve our knowledge of factors affecting the onset and subsequent development of the fishery, to examine the possibilities for fishermen to extend the fishery farther offshore, to start the fishery earlier than is usual, to better "stay on fish" during the season, and to collect biological information on the albacore for research studies concerning fish-ocean relationships and population dynamics.

Research operations are being conducted by five commercial fishing vessels on charter to AFRF and by the NMFS research vessel David Starr Jordan and include oceanography, fishery biology, fish tagging, and fish scouting. In addition, three commercial fishing vessels on charter to AFRF will operate during the fishing season to evaluate the availability of fish in areas other than where the main portions of the fleet are operating and conduct tagging operations. NMFS technicians will be placed on these boats to assist in making oceanographic observations and tagging fish. Also, the Jordan may work cooperatively with the AFRF charter vessels during August.

Sea Surface Temperature and Environmental Conditions

L. EBER AND F. MILLER

Eastern North Pacific

Sea surface temperatures continued to be a little below normal in the Gulf of Alaska and southward to 45°N, and off the North American west coast out to 500 miles or more (Figure 5). Negative departures from normal also occurred west of 165°W, between 35 and 45°N. Most of the remaining portions of the eastern North Pacific were a little warmer than normal. The magnitude of the departures were generally less than 2°F (1.1°C), denoting a weak pattern of anomalous temperatures which is typical of conditions through most of the 1974 winter and spring. Although changes from month to month have occurred in various areas, they have tended to reverse preceding trends, rather than reinforce them, as sometimes happens when a strong anomaly pattern emerges.

For example, April to May seasonal warming was above normal this year in the region 40-50°N, from 145-160°W. This caused a shift from weak negative deviations in this region to weak positive deviations from mean conditions. Similarly, surface waters 300-600 miles southwest of the southern California coast became slightly cooler rather than warmer, and caused temperature deviations to shift from positive to negative in this region.

The eastern North Pacific high pressure cell was well developed in May 1974 and central pressures were up to 6 millibars above normal (Figures 1 and 2). This, coupled with low pressures over hot inland deserts, resulted in tight pressure gradients and strong northerly winds over coastal and offshore areas. Atmospheric pressures in the Gulf of Alaska and over the Aleutian Islands were somewhat lower than normal, causing moderately strong gradients in the central region northwest of the high pressure center. Southwest winds prevailed in this central region, where excess surface warming occurred, and were a little stronger than normal.

Western North Pacific

The pattern of anomalous conditions in the western North Pacific also tended to be rather weak. Negative deviations from normal prevailed in much of the central portion, exceeding 2°F (1.1°C) in several isolated pools (Figure 6). Deviations were positive off southern Japan and southwestward to the Philippines. Positive deviations also occurred east of 165°E in areas south of 33°N and north of 40°N, separated by below-normal surface temperatures in the intervening region.

Eastern Tropical Pacific

During May of each year a rapid cooling from 2-4°F (1.1-2.2°C) is expected in the surface layer of the Peru Current and its equatorial extension out to 110°W. Elsewhere in the southern hemisphere the seasonal cooling north of 30°S is slight. In the northern hemisphere warming is greater than 2°F (1.1°C) in the Gulf of California, off the west coast of Mexico and in the Gulf of Panama. Cold surface water west of Costa Rica (the Costa Rica dome), earlier in the year is not as apparent in May.

In May 1974 the sea surface temperature (Figure 9) pattern resembled that of April 1974 adjusted for the usual seasonal cooling along the coast of South America and along the equator east of 110°W. The sea temperature anomalies (Figure 10) in the southern hemisphere reflected a continued return to normal, particularly in the Peru Current and along the equator. The southeast trade winds were near normal and low cloudiness was extensive in this area. These conditions helped to maintain upwelling and seasonal cooling in the Peru Current. From 5°N to 5°S and east of 85°W, temperatures increased under light winds and clearer than normal skies. As a result, temperature anomalies in this important tuna fishing area changed from negative in April to positive in May 1974 (Figure 10).

In the northern hemisphere between 85-110^{o}W the most significant changes took place west of Costa Rica between 6-12^{o}N where tuna fishing has been active. In this area most of the negative temperature anomalies were reduced by 2^{o}F (1.1^{o}C) from April-May in association with weak winds and near normal cloud cover. To the west and south of Baja California there was not much change in the temperature anomalies (Figure 10) from those in April. Temperatures remained slightly below normal over the northern tropical fishing grounds. Low cloud cover was significantly greater than normal and the westerly wind speeds were 2-4 knots above normal.

Subsurface Temperature Structure in the Northeast Pacific Ocean

J.F.T. Saur

The sections of subsurface temperature presented in Figures 11 and 12 were taken between San Francisco and Hawaii during April 27-May 1, 1974, and between Hawaii and Los Angeles, during May 5-8, 1974. They were prepared from 1-hourly XBT observations supplementing the normal 4-hourly observations made by the mates of the SS Hawaiian Enterprise. We are grateful to Dr.R.L.Bernstein (NORPAX Project, Scripps Institution of Oceanography) and Dr. C.A. Collins (National Science Foundation) for allowing us to use the extra observations which they made during this voyage. The location of observations on the track chart and temperature-depth profiles are shown for only the 4-hourly observations for the sake of clarity. Profiles 1-22 were not available for inclusion in Figure 12. In the upper part of each figure the surface temperature distribution is from hourly observations, but the surface salinity is from 4-hourly observations.

The smallest oscillations shown by the isotherms in these sections are about 44 nautical miles (80 m) in length and 10-20 m in height, and may be an instrumental error since they appear to be related to the spacing of the observations. However, the larger undulations, of 200-400 nautical miles (360-720 m) length and 40-80 m in height which are similar to those typically found in our sections based on 4-hourly observations, appear to be verified by the greater resolution afforded by the 1-hourly observations.

In describing oceanographic conditions we usually identify three regions, (1) the California Current region, (2) Transition Zone and (3) Eastern North Pacific (ENP) central water, which differ in certain respects in the upper 100-200 meters. The distinguishing features will be reviewed with respect to the San Francisco section, Figure 11.

(1) In the California Current region between the coast and 132-134°W the shallow isotherms (e.g., 12°C) slope steeply downward to the west, the mixed layer is shallow near the coast and deepens westward (observations 2, 6-10). The surface salinity is generally less than 33.5 o/oo except for coastal upwelling, and the minimum surface salinity usually lies 100-200 miles off the California coast. (2) In the Transition Zone, from 132-134°W to 140-142°W, the general trend of the isotherms in the thermocline (e.g., 12-13°C) is downward to the west but less steep than in the California Current region. Surface salinities are intermediate, generally between 33.7 and 34.7 o/oo, and the vertical thermal structure is complex, in that the thermocline is interrupted by isothermal layers or by minimum-maximum features in the profile. (3) In the ENP central waters from 142-144°W to Hawaii the isotherms (e.g., 12°C) may undulate but the overall trend is fairly linear. The surface salinities are around 35.0 o/oo or higher, except near Hawaii, and the vertical thermal structure has a broad thermocline which is linear or convex downward as contrasted to the sharp exponential (or concave) thermocline of the California Current region.

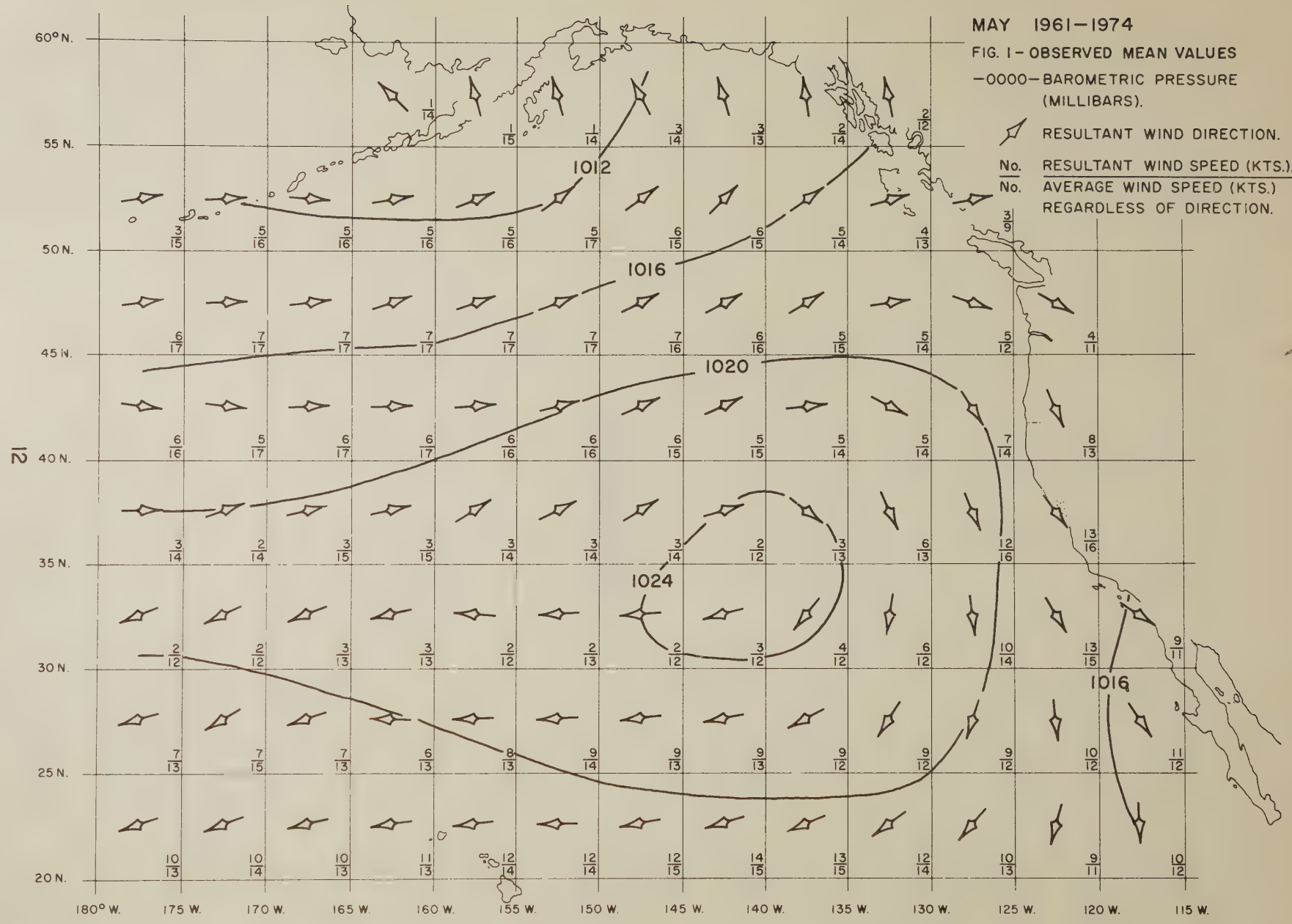
The boundaries which separate the regions described above have not been as sharp nor well defined this year as in 1973. On the San Francisco - Hawaii route in early May 1973 a salinity "front" occurred near 140°W at which the salinity changed by 1 o/oo in the 90 nautical miles between observations. This year the salinity gradient in the same area is only about 1 o/oo in 200 nautical miles (Figure 11). Also the surface salinity change is about 200 nautical miles farther east than the change in trend of the subsurface isotherms (e.g., 8-15°C) which occurs near 143°W. Thus the surface and subsurface criteria for the boundary between the ENP central waters and the Transition Zone indicate different locations The boundary between the Transition Zone and California Current appears to be identified by the surface salinity gradient and sub-surface thermal gradient near 133°W (observation 25) on the San Francisco-Hawaii section.

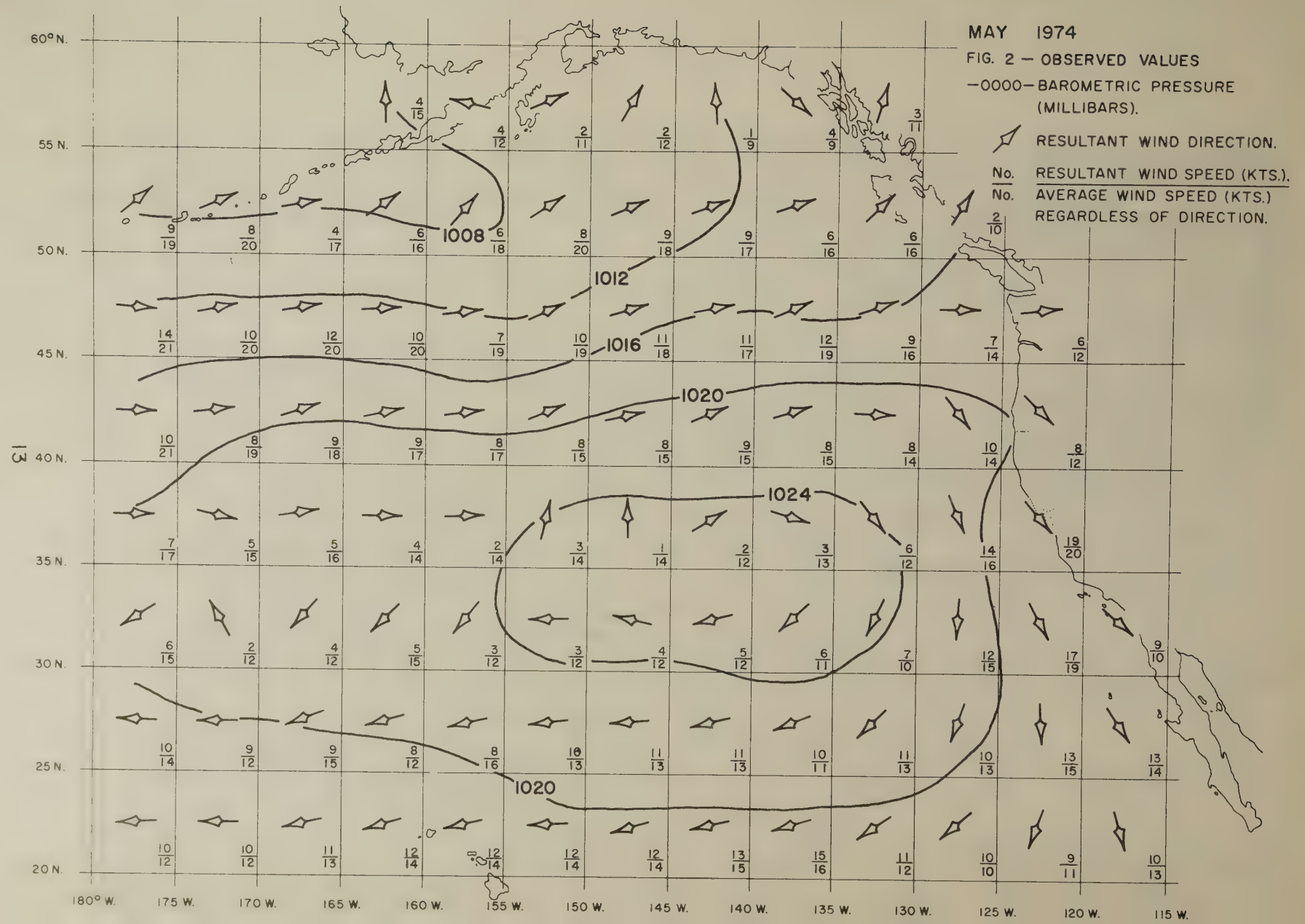
For the Hawaii-Los Angeles route we have no springtime sections from previous years with which to compare the early May 1974 section (Figure 12). The surface salinity gradient and vertical profiles indicate that the boundary between the ENP central water and the Transition Zone, at least in the upper 200 m, is near 133-134°W (observations 62-64). The boundary between the Transition Zone and California Current region is near 131°W (observations 70-72). The location of the Transition Zone based on these considerations is shown on the track chart of Figure 12.

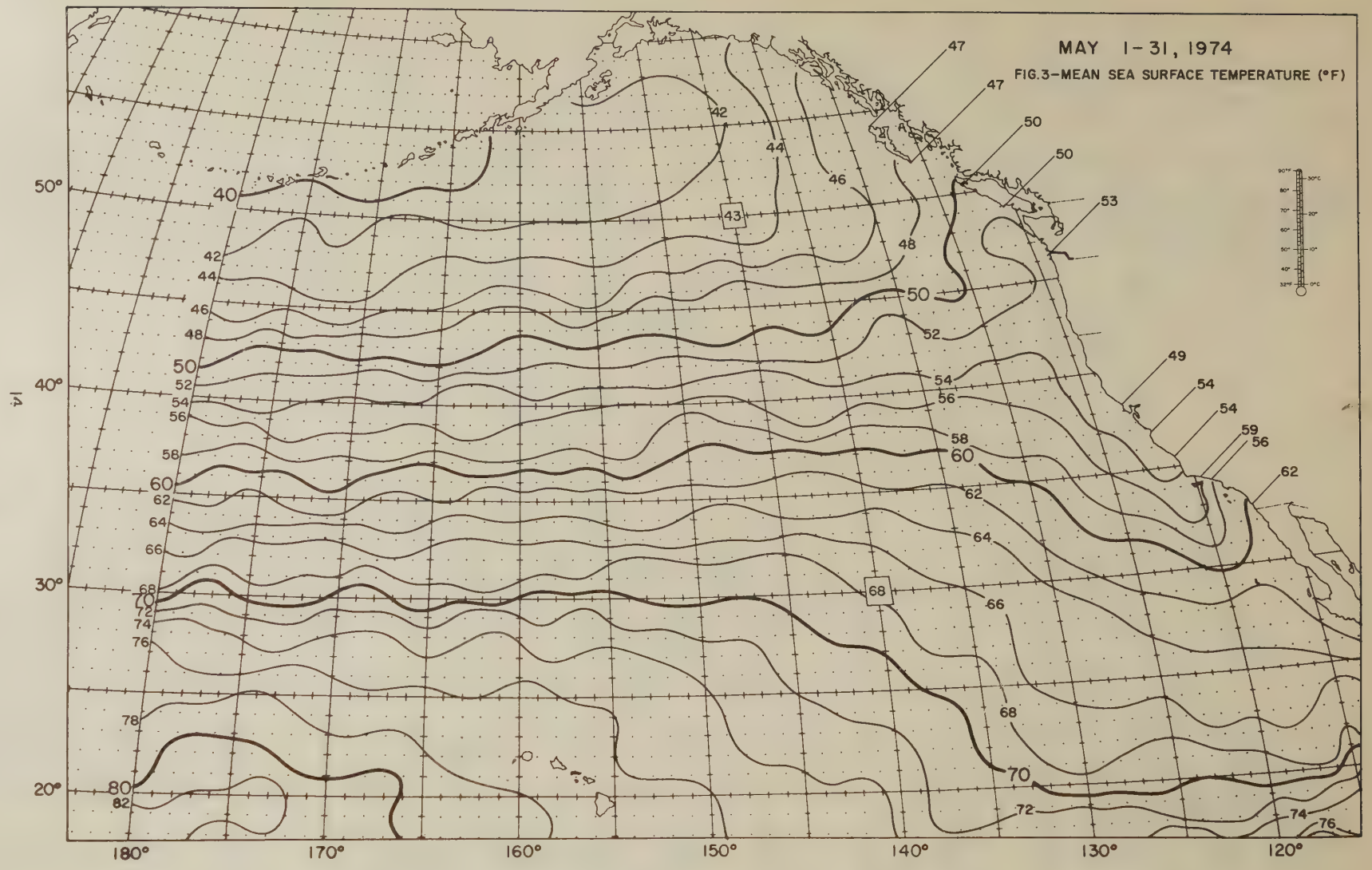
Moderately low salinities (around 34.5 o/oo) continue to persist in the first 100-200 miles east from Hawaii. The maximum in the surface salinity appears shifted to the northeast along the section by about 100 miles compared with last year. The heat content in the western half of the section is as great, or greater, than in the last several years while that along the California coast is as low, or lower. These features are consistent with a northeastward shift of the North Pacific anticyclone (high pressure area), stronger trade winds at higher latitudes than normal, and persistent northwest winds along the California coast.

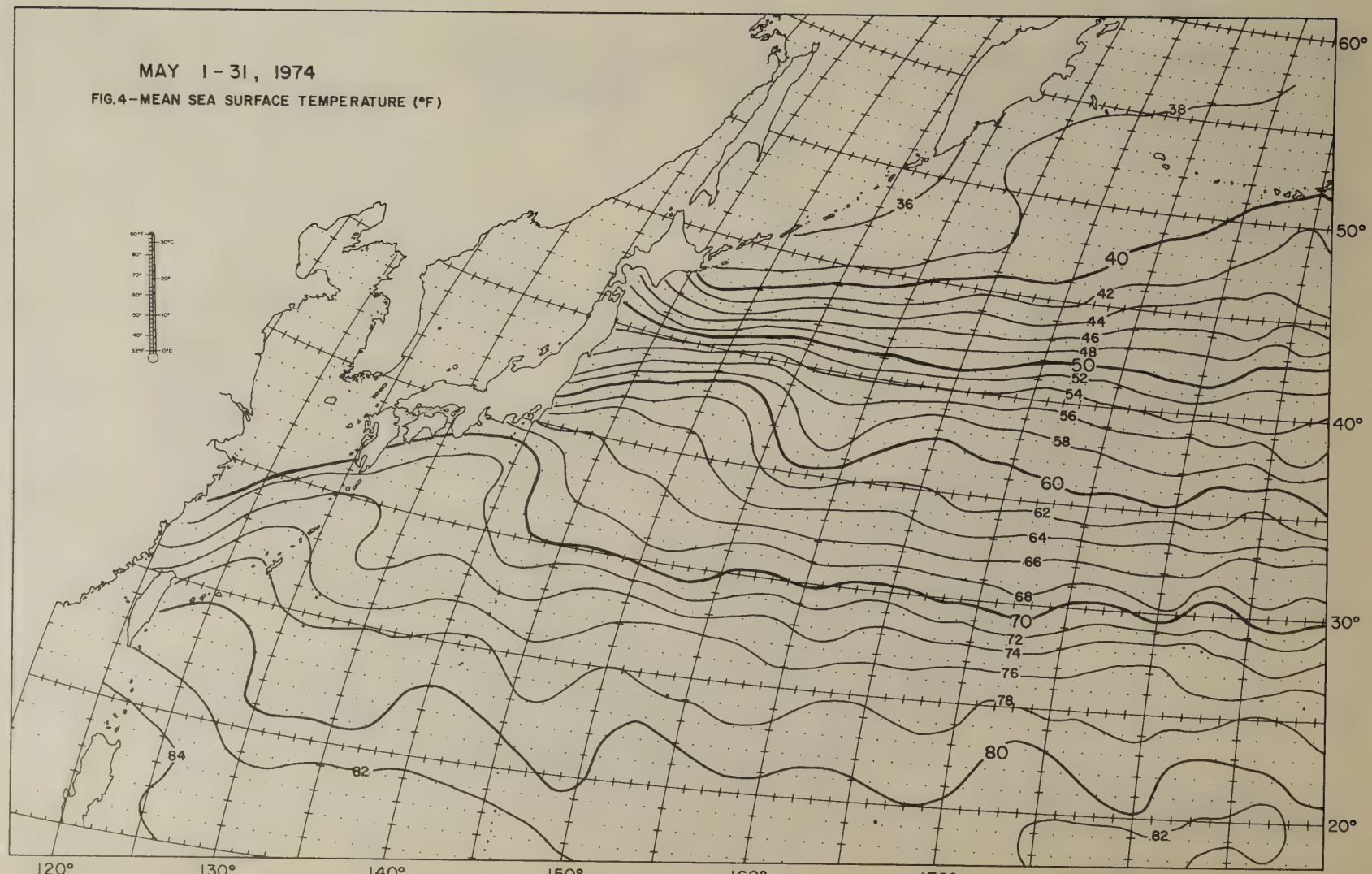
The 16-19°C (61-66°F) temperature zone is shaded in the vertical section so that its seasonal progression and depth changes can be followed in relation to albacore catches. At the surface on the San Francisco-Hawaii route the western edge of the zone (19°C) was near 142°W which is west of the western edge of the Transition Zone. The 16°C isotherm intersected the surface at three locations along the section in the eastern part of the Transition Zone. Where surface temperatures were in the 16-19°C range the depth of the zone remained deeper than 100 m. It is believed that a deep layer of this nature permits the albacore to disperse so that they are less available to the fishery.

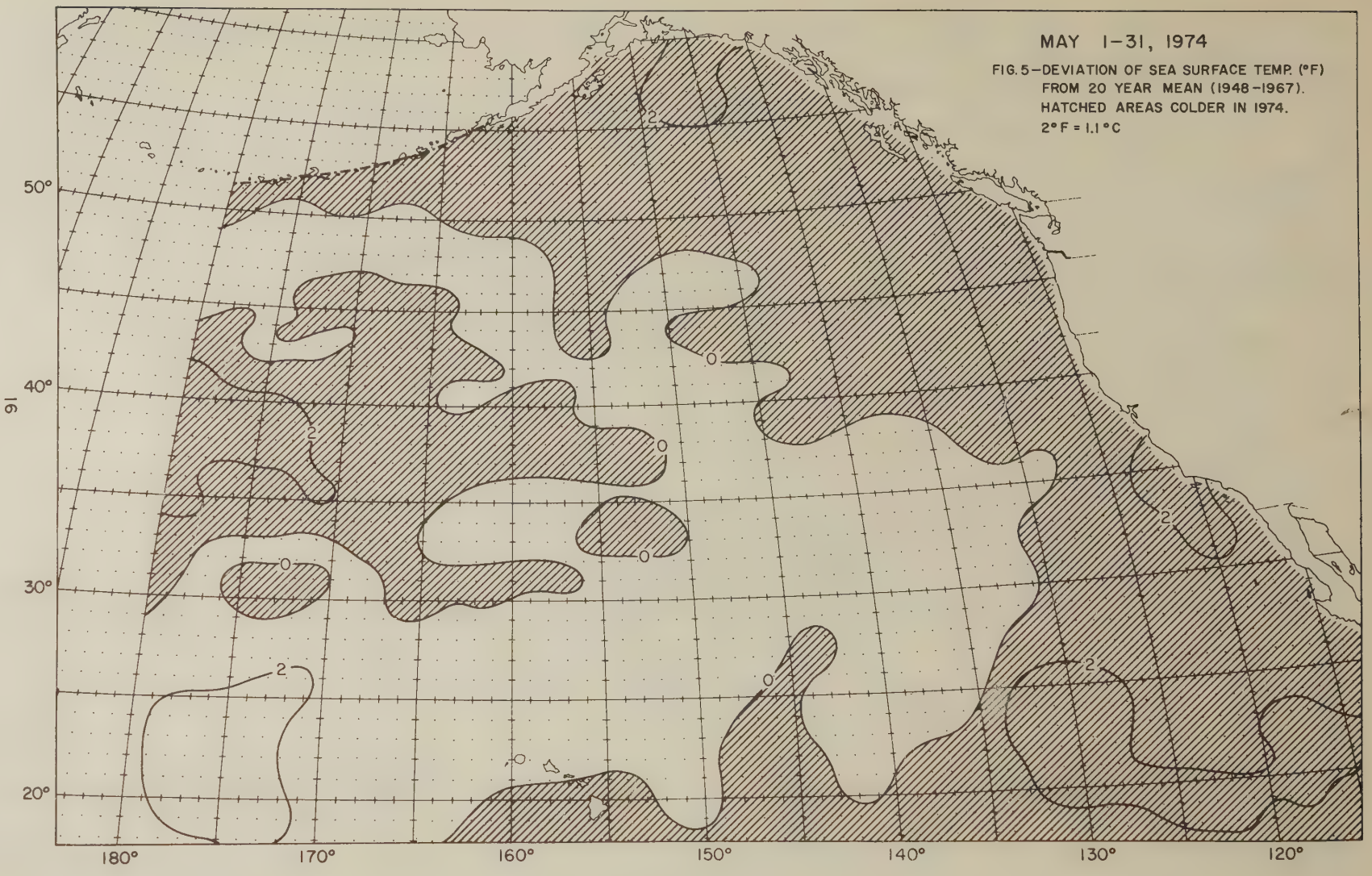
CHARTS

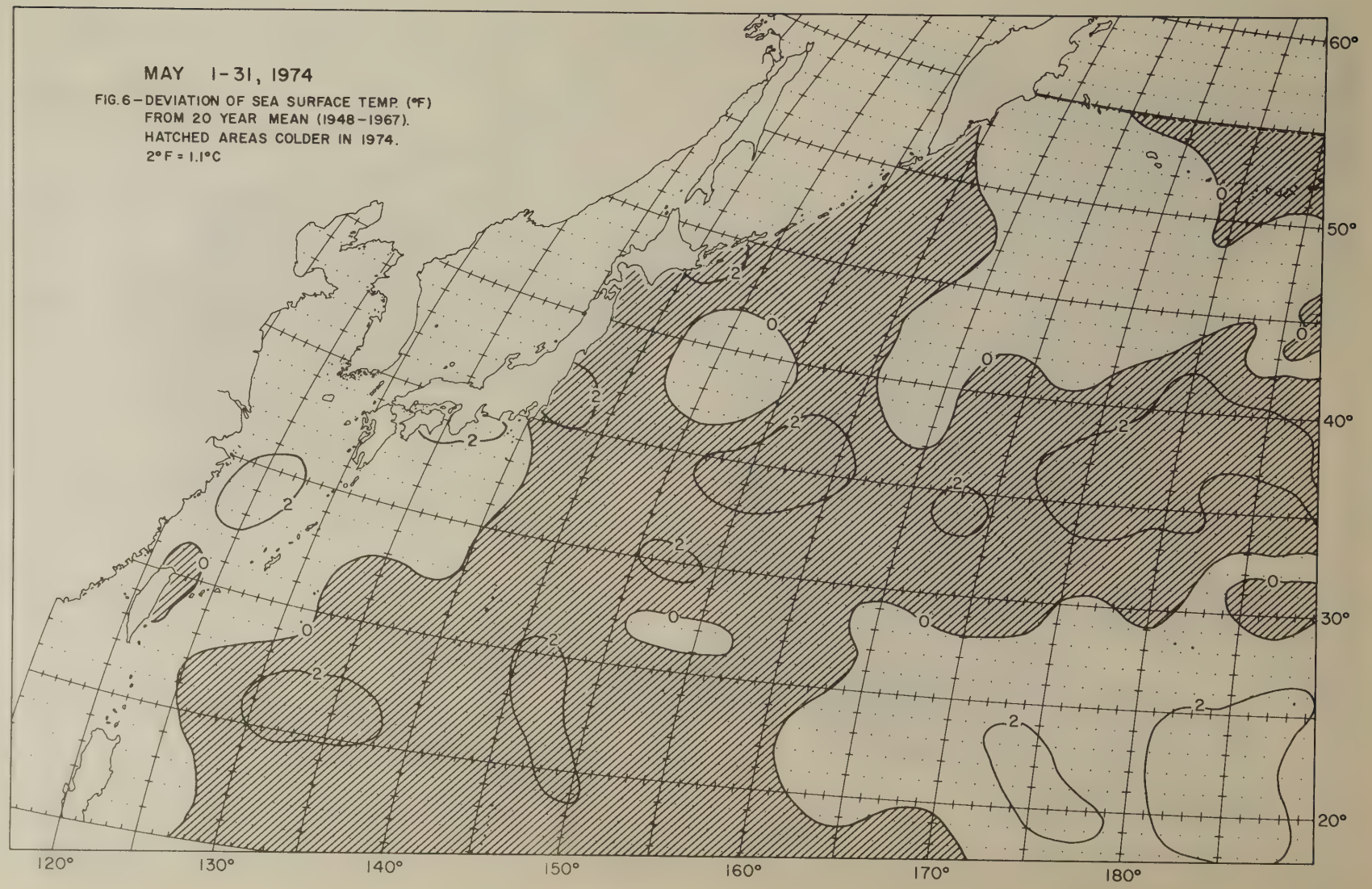

MAY 1961–1974
FIG. 1 – OBSERVED MEAN VALUES
–0000– BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.),
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1012
1016
1020
1024
1016
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

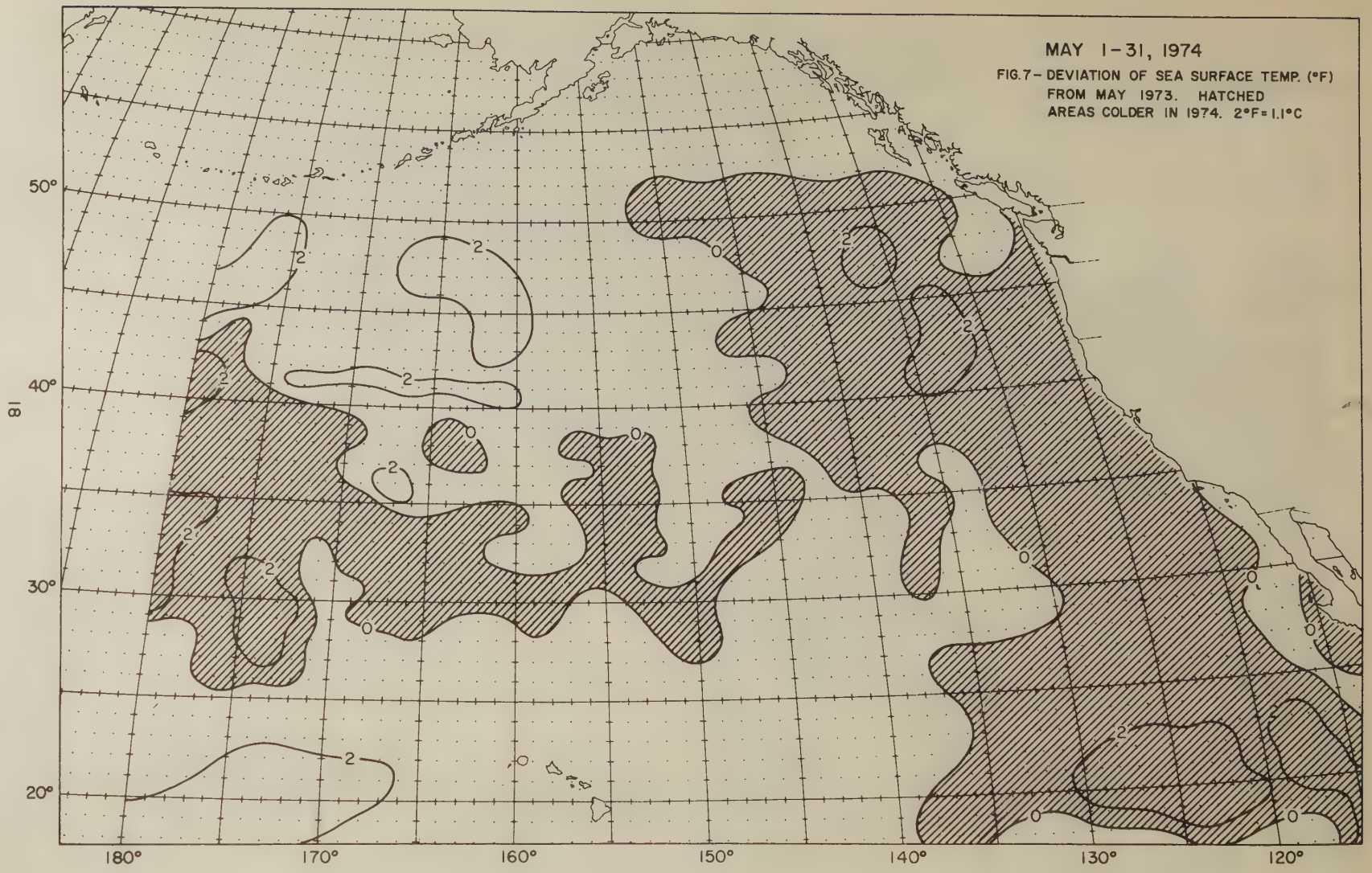

MAY 1974
FIG. 2 — OBSERVED VALUES
—0000— BAROMETRIC PRESSURE (MILLIBARS).
RESULTANT WIND DIRECTION.
No. RESULTANT WIND SPEED (KTS.).
No. AVERAGE WIND SPEED (KTS.) REGARDLESS OF DIRECTION.
1008
1012
1016
1020
1024
1020
60° N.
55 N.
50 N.
45 N.
40 N.
35 N.
30 N.
25 N.
20 N.
180° W.
175 W.
170 W.
165 W.
160 W.
155 W.
150 W.
145 W.
140 W.
135 W.
130 W.
125 W.
120 W.
115 W.

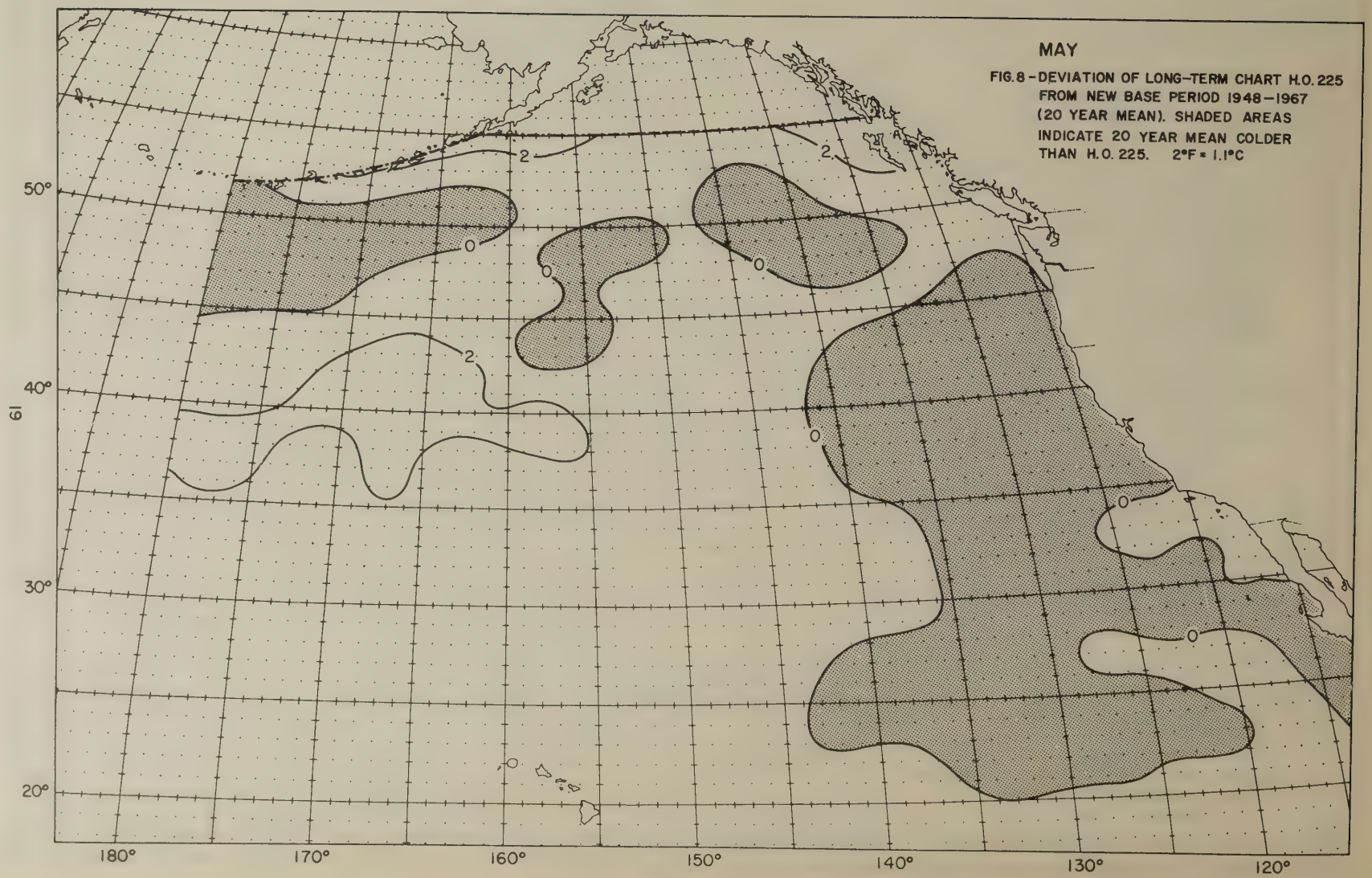

MAY 1-31, 1974
FIG.3-MEAN SEA SURFACE TEMPERATURE (°F)
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
14

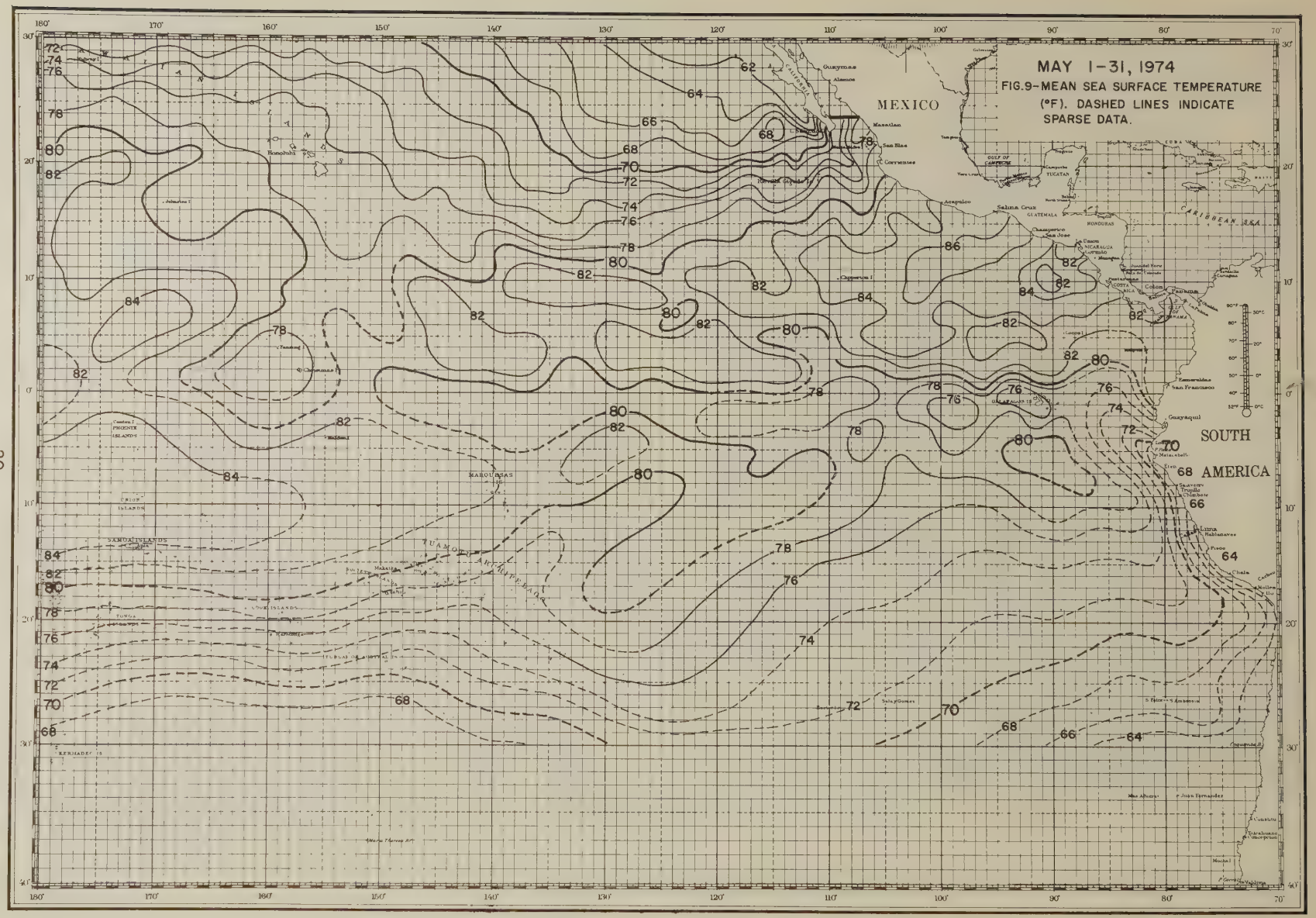

MAY 1-31, 1974
FIG.4-MEAN SEA SURFACE TEMPERATURE (°F)
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
72
74
76
78
80
82
84
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


MAY 1-31, 1974
FIG. 5—DEVIATION OF SEA SURFACE TEMP. (°F) FROM 20 YEAR MEAN (1948-1967). HATCHED AREAS COLDER IN 1974.
2° F = 1.1 °C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
2
0
2
0
0
2
0
2
0
2
0


MAY 1-31, 1974
FIG. 6 – DEVIATION OF SEA SURFACE TEMP. (°F)
FROM 20 YEAR MEAN (1948–1967).
HATCHED AREAS COLDER IN 1974.
2° F = 1.1° C
60°
50°
40°
30°
20°
120°
130°
140°
150°
160°
170°
180°


MAY 1-31, 1974
FIG.7- DEVIATION OF SEA SURFACE TEMP. (°F) FROM MAY 1973. HATCHED AREAS COLDER IN 1974. 2°F = 1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
2
0


MAY
FIG. 8 - DEVIATION OF LONG-TERM CHART H.O. 225 FROM NEW BASE PERIOD 1948–1967 (20 YEAR MEAN). SHADED AREAS INDICATE 20 YEAR MEAN COLDER THAN H.O. 225. 2°F = 1.1°C
50°
40°
30°
20°
180°
170°
160°
150°
140°
130°
120°
2
0


MAY 1-31, 1974
FIG.9-MEAN SEA SURFACE TEMPERATURE (°F). DASHED LINES INDICATE SPARSE DATA.
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
Honolulu
Acapulco
Salina Cruz
Guayaquil
Callao
Lima
Arica
Valparaiso
Easter Island
Galapagos Islands
Marquesas Islands
Tuamotu Archipelago
Samoa Islands
Fiji Islands
Tonga Islands
Cook Islands
Kermadec Is.
Juan Fernandez

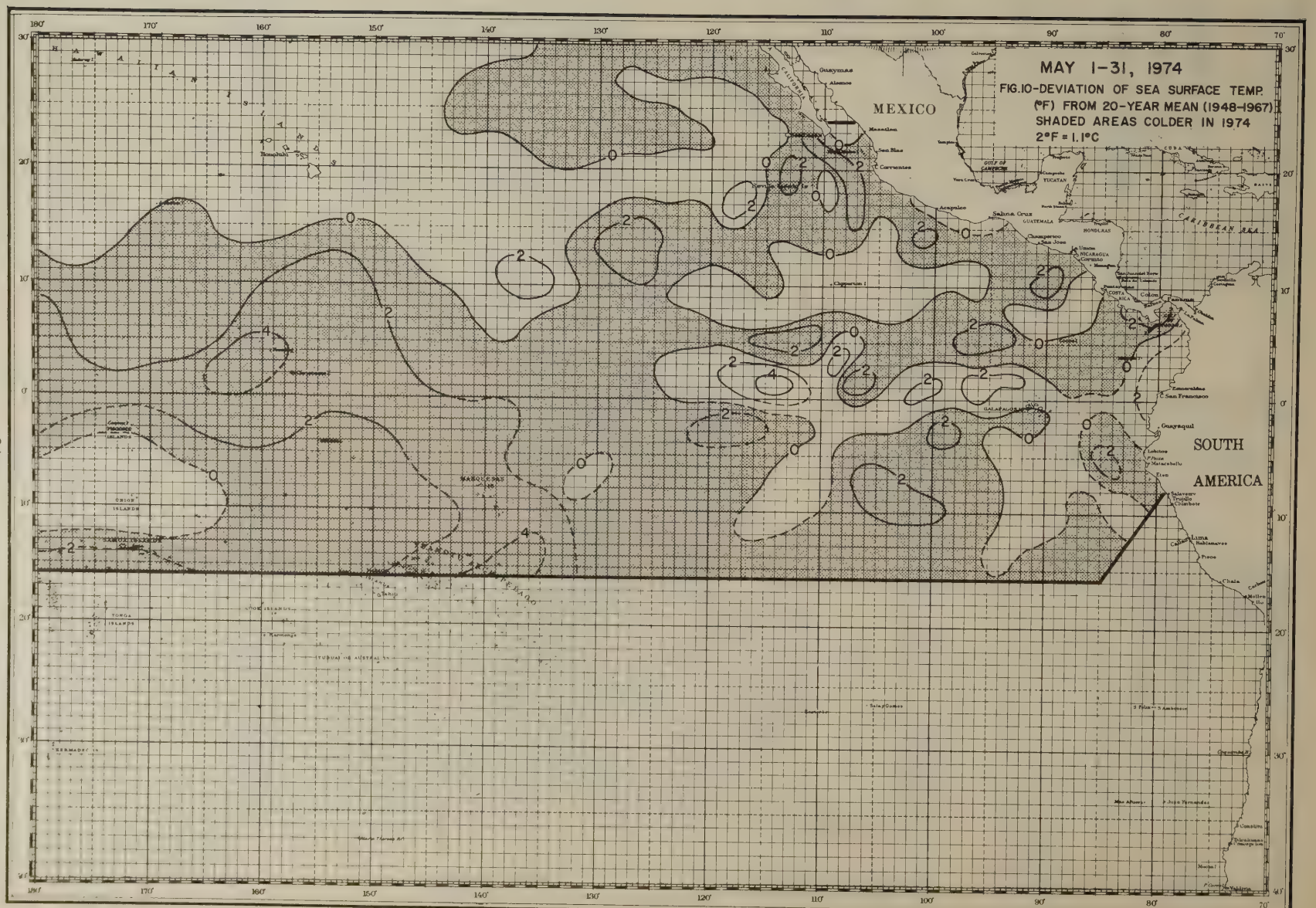
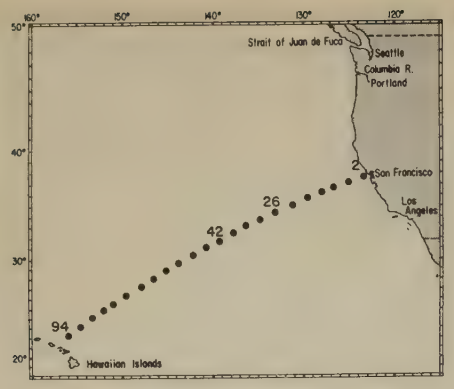
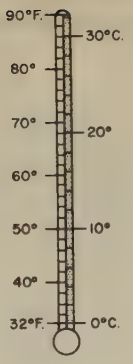

MAY 1–31, 1974
FIG.10–DEVIATION OF SEA SURFACE TEMP. (°F) FROM 20-YEAR MEAN (1948–1967)
SHADED AREAS COLDER IN 1974
2°F = 1.1°C
MEXICO
SOUTH AMERICA
CARIBBEAN SEA
HAWAIIAN ISLANDS
Honolulu
Guaymas
Alamos
Mazatlan
San Blas
Corrientes
Acapulco
Salina Cruz
GUATEMALA
HONDURAS
NICARAGUA
COSTA RICA
Panama
Guayaquil
Salaverry
Trujillo
Chimbote
Lima
Callao
Pisco
Chala
Matarani
Ilo
Arica
Iquique
Antofagasta
Coquimbo
Valparaiso
San Antonio
Talcahuano
Corral
Puerto Montt
Chiloe
Juan Fernandez
Mas Afuera
Easter I.
Pitcairn I.
Henderson I.
Oeno I.
Ducie I.
Gambier Is.
Tuamotu Is.
Tahiti
Moorea
Society Is.
Marquesas Is.
Galapagos Is.
Cocos I.
Clipperton I.
Revillagigedo Is.
Socorro I.
Roca Partida
Islas Marias
Tres Marias Is.
Guadalupe I.
Cedros I.
Isla Natividad
Punta Eugenia
Magdalena Bay
Cabo San Lucas
Cabo San Francisco
Isla de la Plata
Isla Lobitos
Isla Foca
Isla Macabelli
Isla Lobos de Tierra
Isla Lobos de Afuera
Isla Chao
Isla Mejillones
Isla Pajaros
Isla Santa
Isla Blanca
Isla Guañape Norte
Isla Guañape Sur
Isla Asia
Isla Pescadores
Isla Independencia
Isla San Gallan
Isla Chincha Norte
Isla Chincha Sur
Isla Mazorca
Isla Amortajado
Isla Lobos de Tierra
Isla Lobos de Afuera
Isla Chao
Isla Mejillones
Isla Pajaros
Isla Santa
Isla Blanca
Isla Guañape Norte
Isla Guañape Sur
Isla Asia
Isla Pescadores
Isla Independencia
Isla San Gallan
Isla Chincha Norte
Isla Chincha Sur
Isla Mazorca
Isla Amortajado

FIGURE 11





HONOLULU – SAN FRANCISCO

APRIL 27– MAY 1, 1974

SS HAWAIIAN ENTERPRISE

VOYAGE 89

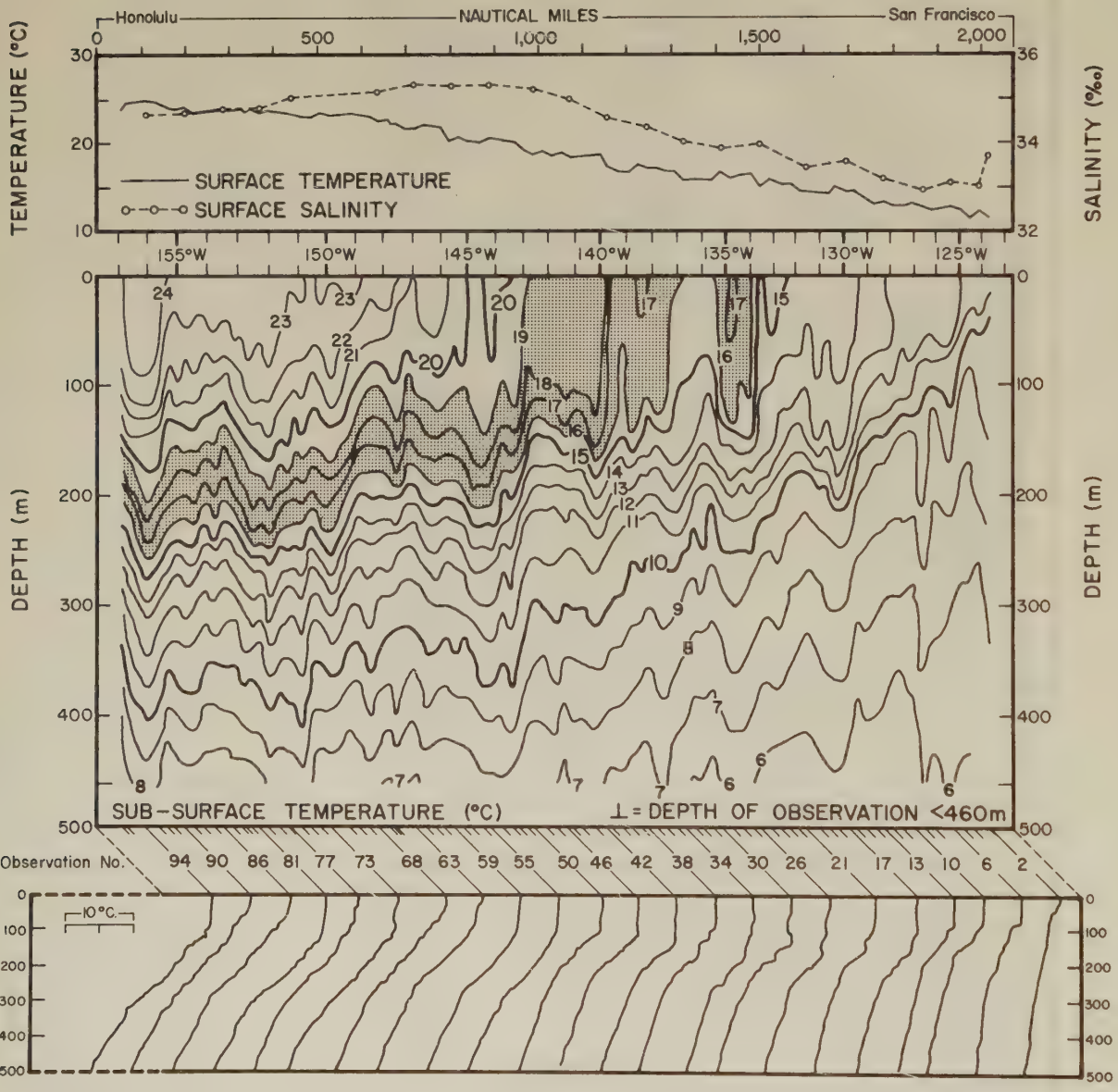
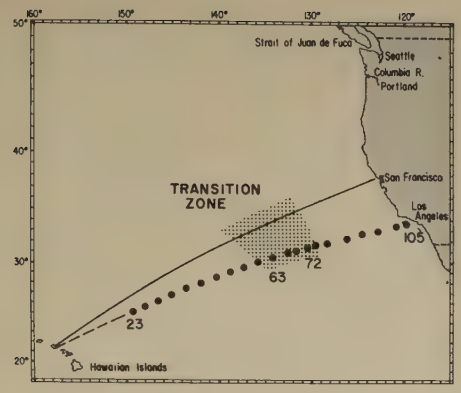
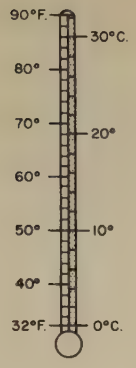


FIGURE 12



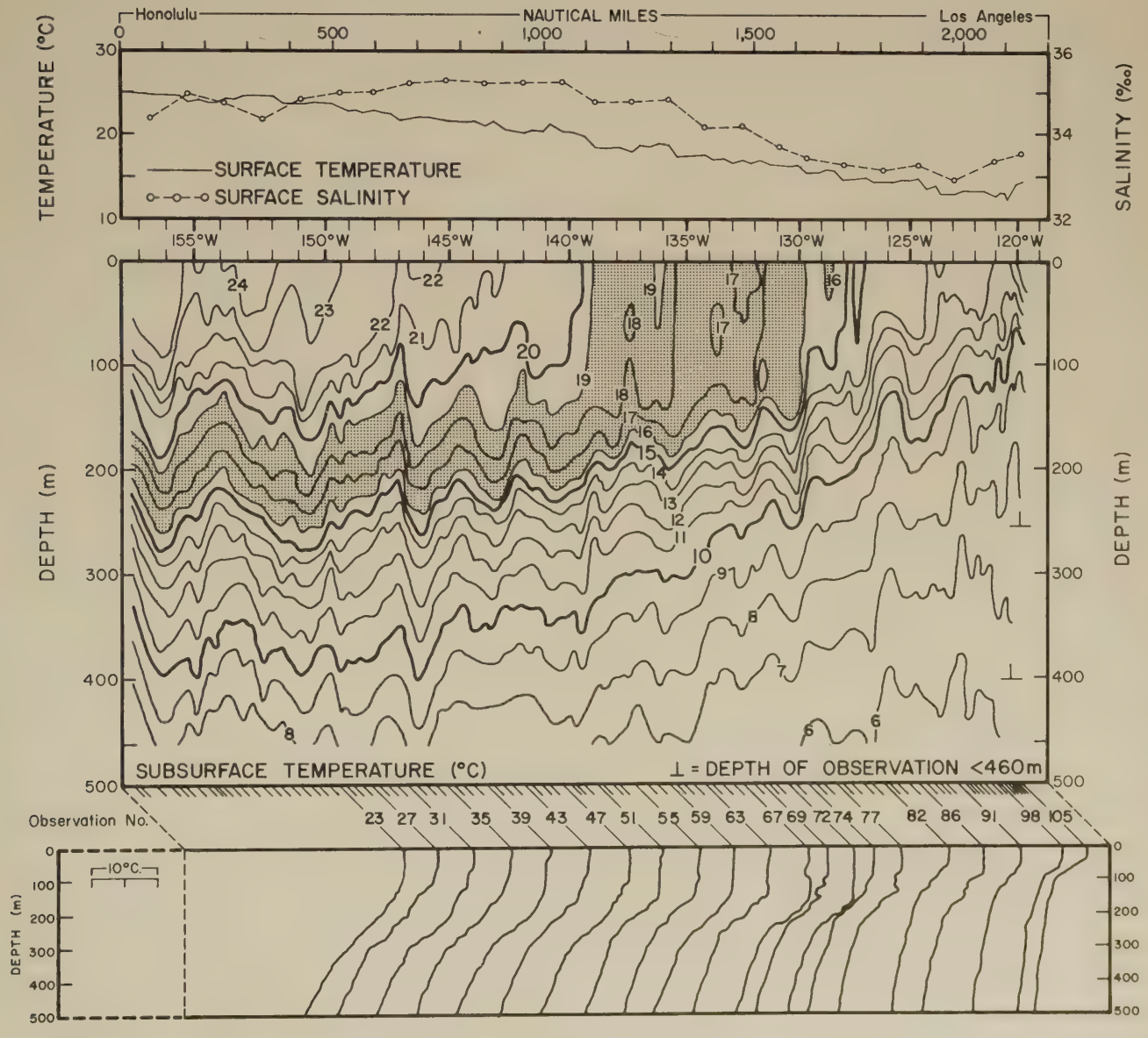


HONOLULU — LOS ANGELES

MAY 5-8, 1974

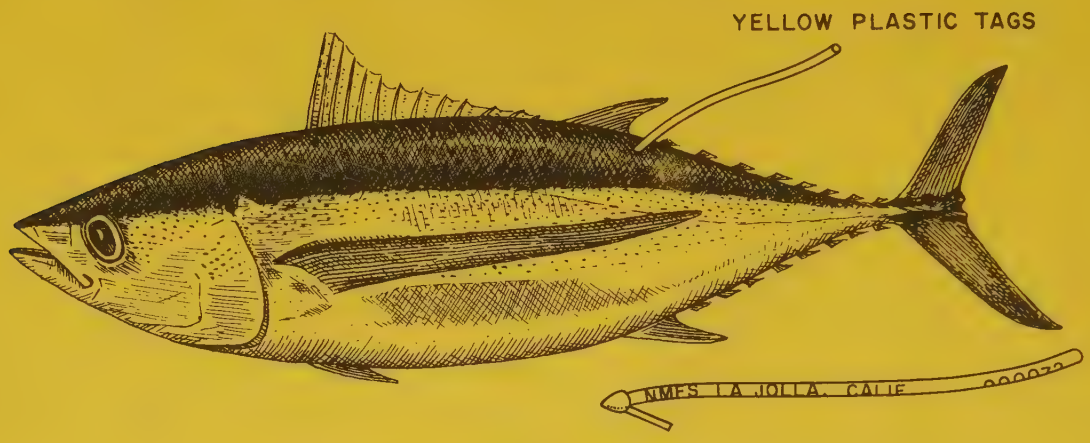
SS HAWAIIAN ENTERPRISE

VOYAGE 89



$ REWARD $

FOR ALBACORE TUNA TAGS



THE
NATIONAL MARINE FISHERIES SERVICE WILL PAY $ 2.00 FOR EACH TAG RETURNED (SOME FISH HAVE MORE THAN ONE TAG).

THE
AMERICAN FISHERMEN'S RESEARCH FOUNDATION WILL AWARD CASH PRIZES FOR THE NUMBERS DRAWN IN AN ANNUAL LOTTERY.

WRITE:

- WHERE
- WHEN
- HOW

} *FISH WAS CAUGHT*

- LENGTH OF FISH (TIP OF LOWER JAW TO FORK OF TAIL)

FORWARD TO NMFS ADDRESS ON TAG OR TO AFRF
4904 N. HARBOR DRIVE, SAN DIEGO, CALIFORNIA

Daily broadcasts of albacore fishing information prepared by NOAA's National Marine Fisheries Service will be transmitted over marine radiobands starting July 9 and extending to October 31 or until the season ends. The broadcasts will be made on weekdays and Saturday mornings by the following radio stations:

WWD (La Jolla, California) on SSB carrier frequencies 4409.4, 8789.6, and 12424.5 kHz at 0615 and 1745 PDT on weekdays and 0715 on Saturdays.

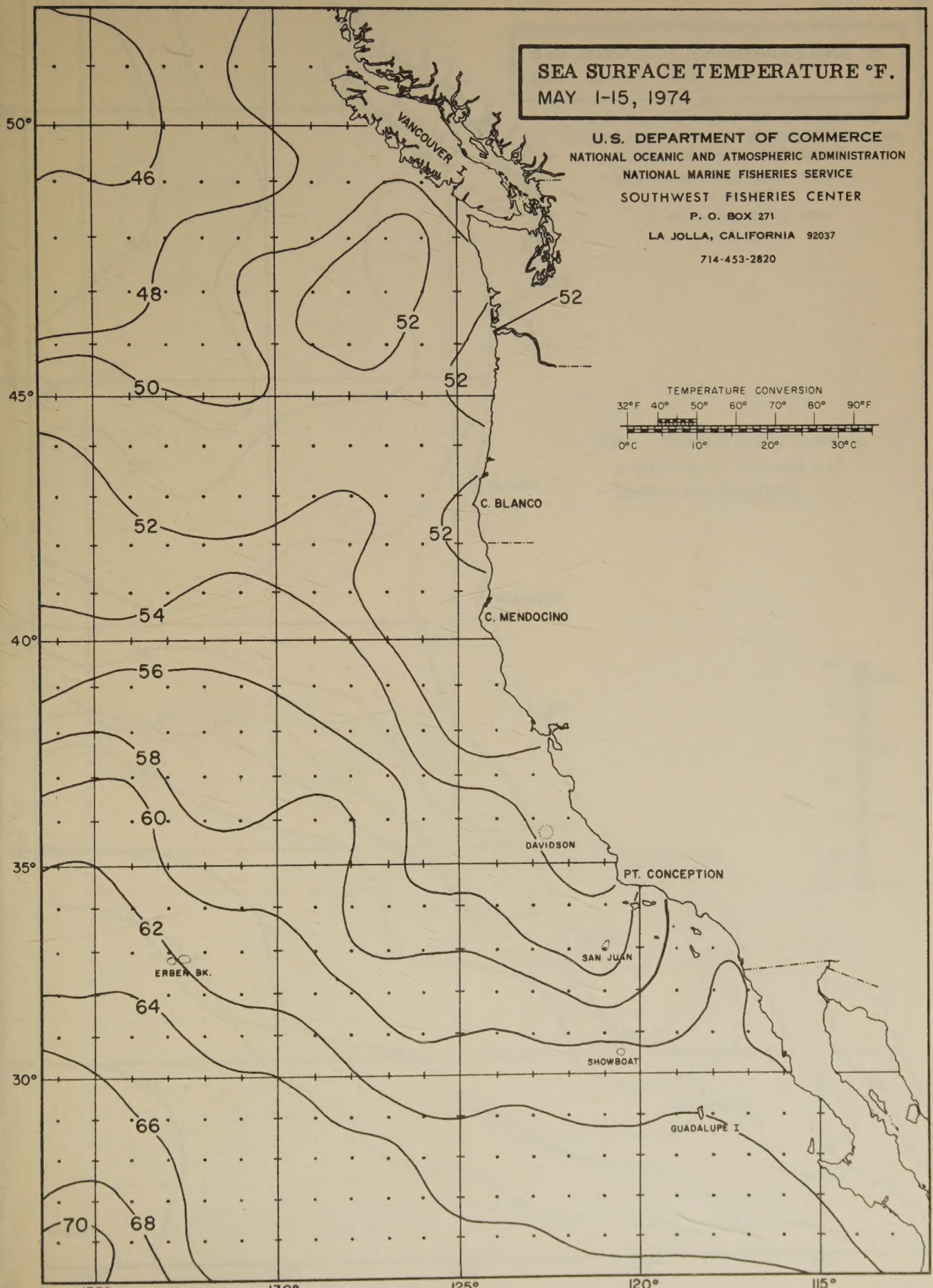
KFX (Astoria Marine Operator) on 2598 kHz at 0630 and 1945 PDT.

KNPT (Newport, Oregon) on commercial AM 1310 kHz at 0615 and 1915 PDT.

NMC (Point Reyes Coast Guard) on AM compatible frequency 2670 and on SSB carrier frequencies 4383.8, 8732.1, 13147.5 kHz at 0645 and 1945 PDT.

(to determine the upper sideband assigned frequencies for tunable receivers add 1.4 kHz to WWD and NMC carrier frequencies)

FISHING INFORMATION – supplement



FISHING INFORMATION – supplement